
Unintentional non-compliance or sheer ignorance of aircraft safety regulations: a critical analysis of a safety occurrence in Australian general aviation

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Abstract: The highly regulated aviation industry is around 100 years old by now and many large corporations are becoming involved in operations of aircraft. Therefore, aviation regulatory authorities are under pressure to deregulate some aircraft operations activities. However, most safety-sensitive activities, such as who can be carried on board an aircraft in flight, are still regulated under civil aviation regulations. One of the regulations known as ‘carriage of passengers on prohibited flights’ is directly related to safety of passengers and aircraft. Violation or non-compliance of this regulation may jeopardise the safety of both passengers and the aircraft. This paper illustrates and examines the safety issues by carrying out a case study at a general aviation aircraft operator in Australia, where a non-compliance of this regulation had occurred. The typical flight was carried out as a post-maintenance test flight and members of public were taken on board the flight. The paper also attempts to identify any human factor issue in this case.

Keywords: aircraft; airline; airworthiness; aviation; engineering; flight; operations; pilot; regulations; safety.

Reference to this paper should be made as follows: Yadav, D.K. and Herbert, J. (2021) ‘Unintentional non-compliance or sheer ignorance of aircraft safety regulations: a critical analysis of a safety occurrence in Australian general aviation’, *Int. J. Reliability and Safety*, Vol. 15, No. 3, pp.205–215.

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1 Introduction

Aviation industry plays a multidimensional role in regional and national development of a nation. The industry is divided into various sections and general aviation (GA) segment operates helicopters and small airplanes on non-scheduled flights or on charter routes. Mostly, it serves businesses and remote regional communities in Australia and beyond. The industry has achieved amazing development and despite cycles of global economic downturns, the industry remains one of the largest employers of pilots and skilled professionals. Since its inception, this industry has been highly regulated due to embedded risks of aircraft operations. Therefore, the International Civil Aviation Organisation (ICAO) develops aircraft safety standards, which are administered by relevant National Aviation Authorities (NAAs) in their respective jurisdictions as civil aviation regulations. For example, the Civil Aviation Safety Authority (CASA) of Australia is responsible for regulating civil aviation in Australia.

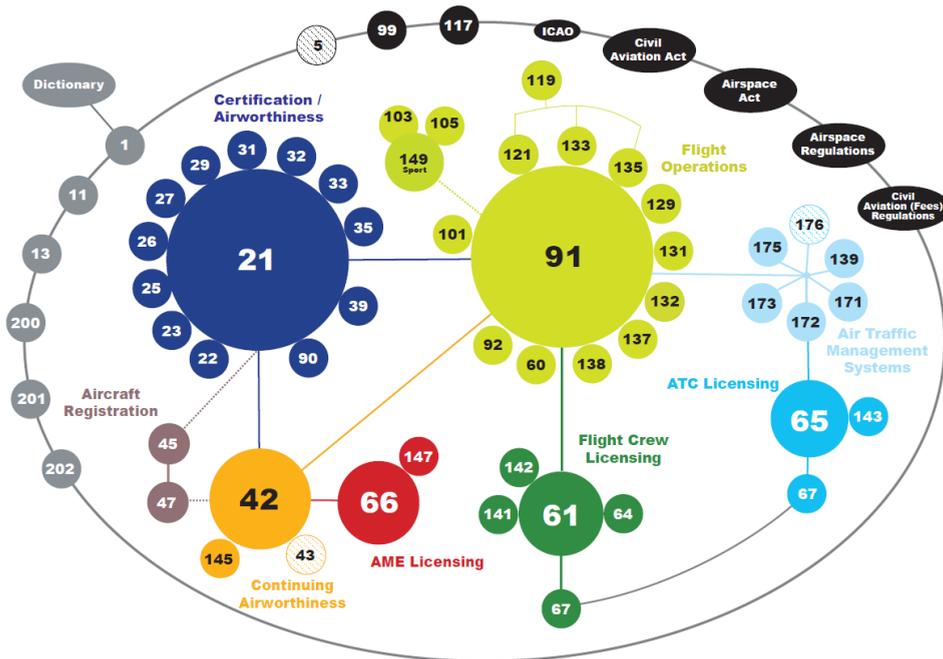
Traditionally, the regulations have been prescriptive type, but new safety legislative regimes based on outcome-based regulatory philosophy are becoming popular in recent years. The performance-based regulations are focused on achieving results while giving organisations the flexibility in achieving them in a cost-effective manner. These regulations set goals for the outcome of the behaviour instead of establishing a specific instruction to attain that behaviour. Therefore, Australian GA industry operates under a combination of prescriptive and outcome-based aviation regulatory framework. However, the International Transport Federation (1994) argues that despite claiming economy and safety as separate issues, the economic liberalisation causes an impact on aviation safety standards. Consequently, the standards have been diluted and organisations are under commercial pressure since then. This causes non-compliance of the standards to reduce cost of flight operations and aircraft airworthiness.

This paper has carried out a case study of a general aviation aircraft flight event and analyses the occurred non-compliance. The flight was operated by test pilots and aircraft engineers to carry out required post-maintenance airworthiness tests on the aircraft necessary for the return-to-service after going through mandatory maintenance at their facility in Australia. To protect identity of the organisation and personnel, identity information of this real case has been anonymised. The case study indicates some errors of judgement by pilots, which were caused by misinterpretation of the civil aviation regulations related to “carriage of passengers on prohibited flights”. Additionally, an aviation-system failure related to passenger manifestation and information recording documentation is highlighted by this study. The paper however could not find any obvious human factor or intentional non-compliance as such in this case.

2 Background and regulatory requirement

Primary importance in an aviation operation is safety of aircraft and its onboard occupants. Therefore, ongoing safety assurance is maintained by keeping risks at an acceptable level. Consequently, airworthiness of the aircraft and compliance of approved standard operating procedure (SOP) for flight operations are determinative factors in assuring the safety. This instigates a need for developing the SOPs and regulating safety sensitive activities though statutory mandates mostly to ensure their compliance (Figure 1). Airworthiness of aircraft, flight operations, and airspace are three core areas of safety sensitive activities of the civil aviation industry according to Figure 1. Consequently, the civil aviation regulatory framework is design to regulate all elements of the three areas (CASA, 2022). Typically, this includes competency requirements for aeronautical personnel, aircraft airworthiness activities beginning with prototype design stage to final flight test stages, flight operation procedures and practices, airspace classifications and air navigation rules. The airworthiness also includes aircraft maintenance and flight testing. However, in complex aeronautical operations, such as aircraft maintenance, safety cannot be achieved by standards alone. It requires an ongoing support of social engineering and an organisational structure committed to training, human factors, accountability reviews, and risk management processes.

Figure 1 Aviation regulatory framework (after CASA, 2022)



Likewise, who can be carried onboard a typical flight is also regulated under prescriptive civil aviation safety regulations 1998 part 142.370 and part 141.295 (Federal Register of Legislation, 2022). Some restrictions also apply under regulation number 249 of the civil aviation regulations 1988 on this matter. Australia has two sets of active aviation

regulations known as civil aviation safety regulations 1998 (CASR1988) and civil aviation regulations 1988 (CAR1988). Therefore, the regulations are spread across both the sets. This causes confusions to the industry stakeholders at times and increases the risk of potential non-compliance of the regulations as a result. According to the regulations, carriage of passengers is prohibited on an abnormal flight operation activity. For example, a test flight or a training flight is considered as an abnormal flight operation under these regulations. The CASA had acknowledged in the past that compliance with traditional prescriptive legislation did not guarantee safety and compliance to the prescriptive legislation might become an obstacle to aviation safety, because of the complex technical specialisation of the modern aviation organisations (Yadav and Nikraz, 2014). The researchers argued that the regulatory authorities should be interested in safety outcomes, not necessarily how the outcomes were achieved. Furthermore, regulations should have a risk-based approach. Therefore, there was a call for the regulatory authorities to deregulate few activities and shed some of its aviation safety responsibilities to the industry.

Conversely, the safety performance of an air operator certificate (AOC) holder cannot be directly measured for rare and catastrophic accidents, such as hull loss. Therefore, it must be predicted. This makes the implementation of the performance standards more difficult. Since the consequences of regulatory failure related to aircraft safety are significantly high, the nature and extent of these consequences may affect the choice of performance versus prescriptive standards. Therefore, regulations related to carriage of passengers on aircraft are still prescriptive in nature in order to ensure safety of aircraft and its occupants, because outsourcing of certain safety sensitive activities can create challenges for NAAs and AOC holders in ensuring compliances of required standards. Economic issues occasionally do influence safety outcomes, but companies are struggling with their responses to regulatory compliances for several reasons. Scott et al. (2005) believe that regulatory issues are often extremely complex and generally interdependent. Organisations consider trade-offs between maximising profits and economic factors while considering the interests of their stakeholders when deciding about regulatory standpoints, the researchers argued. Therefore, the AOC holders need to consider regulations as a core element of their business strategy.

3 The case study of a GA operator in Australia

Aviation is one of the safest industries, but accidents and incidents still happen. There may be various reasons for the accidents, but according to Thatcher (2008), 70% of aircraft accidents and incidents happen due to pilot errors. These errors not necessarily caused by complacencies or misjudgements though. Alike, Dismukes et al. (2007) believe that some aviation accidents are simply system-accidents resulting from lack of proper information available to pilots. The flight crew then experience difficulties in assessing the situations that become ambiguous in absence of adequate information. Though pilots are highly competent professionals, and they are well trained in technical and non-technical flight skills including crew resource management (CRM) and error management, the errors still happen, the researchers agreed. The skills are learned through regular CRM training sessions that include communication, teamwork, failure scenarios, etc. Pilots also undergo regular refresher training and tests to assess their

competency in the required skills area. This is a part of the safety systems approach to aircraft operations, the researchers noted.

The case examined by this paper is mentioned below:

On a fine Saturday afternoon of year 2018 at a small airport in regional Australia, a couple of low-capacity aircraft were scheduled by engineering department of a GA company for test flights after carrying out mandatory major maintenance on the aircraft. The pilot in-charge (PIC) of the company's flight operations base at the airport scheduled himself as pilot flying (PF) and captain of the aircraft for both the test flights. Another senior pilot of captain rank was deputised as pilot monitoring (PM) and first officer (copilot) of the aircraft to conduct both the test flights.

The PF had received a request from a ramp attendant (RA) identified as RA1 of the company requesting if he could come along on one of the flights with another ramp attendant known as RA2 and three of his friends who were members of public as passengers. The PF approved the request and allowed the ramp staff and passengers to travel onboard the flight. Similarly, the PF also approved another four members of the public with their four children to travel on the second flight.

Notably, both the flights were classified as post-maintenance test flights according to SOP of the company. Therefore, a team of technical personnel including pilots and aircraft engineers only can carry out this kind of flights. Furthermore, a test flight is considered as an abnormal flight under Australian CASR 1998 and CAR 1988 (Federal Register of Legislation, 2022). This means that carrying passengers onboard such flights are not allowed. Hence, it can be confirmed that the flight operations activity has violated the regulations related to "carriage of passengers on prohibited flights". Carrying passenger on an abnormal flight can jeopardise safety of the aircraft and its occupants onboard the flight. This is a situation of non-compliance of SOP and the regulations, because it implies that the aircraft captain who was also the PF has commenced the flight without ensuring safety of the aircraft and legal compliance of the performed flight.

Further investigation of the incident reveals that the PF believed that as the pilot in-charge of the base, he had the authority to authorise passengers to travel on a non-revenue flight. This indicates that he was not aware of the regulatory difference between a non-revenue flight and an abnormal flight. Therefore, he considered the flight as a non-revenue flight and allowed the passengers to travel. Aircraft operating companies complete certain documentation, such as passenger manifest and indemnity form in their system for commercial flights, but this company did not require passenger manifest for a non-revenue flight according to their policy. Therefore, the noncompliance could not be picked up by operations staff of the company. Both PF and PM were also aware that a passenger manifest was not required for non-revenue flights. However, aircraft engineer of the test flight team was surprised to see the passengers onboard the aircraft and questioned the PF, if it was allowed to carry passengers on the flight and the PF answered as yes.

During flight planning phase of the flight both the PF and PM conducted the normal pre-flight planning, and the PF did not pay attention to many required documents, such as flight report, flight test form and ground test form, because he had done so many of these tests previously and did not think this flight was anything out of the ordinary. He had completed the other pre-flight paperwork though, including sector load sheet, daily flying report, weather and the aircraft flight records in the flight planning room. Once the aircraft was on the apron the flight crew commenced their normal pre-flight checks and

start-up procedures. The aircraft was cleared for the flight by air traffic control a few minutes later and pilots commenced the flight.

Once airborne, the aircraft tracked its planned flight route and climbed to 2000 ft. This altitude is not considered too low for any GA aircraft, because they are small and low performance aircraft (Figure 2). At that altitude, the PF turned off the seatbelt, so that the passengers could move about and take photos out of the windows, if they want. The company procedures do not prohibit this. Soon after, female passengers had left their seats, undressed to their bikinis and started taking photos of each other in the aircraft cabin. The flight crew team did not give any permission to the passengers to undress to their bikinis. Furthermore, one of the female passengers entered the cockpit gangway to take a photo, the PF felt that it was not appropriate and took actions, such as turning on the seatbelt signs and making an announcement to get them to put on their clothes. The passengers complied with the PF's instruction. On this, the pilots commented that the passengers were neither disorderly nor they distracted the crew in doing their duties. The pilots believed that safety of the flight was not compromised by the passengers' behaviour, and they also confirmed that the aircraft did not descend below 500 feet (above ground level) altitude, enroute. So, the low-flying related CARs were not breached.

Figure 2 A typical GA aircraft



After landing, the engineer reported the occurrence to the engineer in-charge (EIC) of the base, but the PF did not think that it was a reportable event. So, he did not submit any safety report to the regulatory authority. Furthermore, he destroyed the certificate of indemnity forms of the passengers, because he believed that there was no requirement to retain them. Both pilots did not see any reason to report the onboard event of the flight as they believed that flight safety was not compromised. Therefore, they moved on to the second flight and carried rest of the passengers on the flight believing that the PF has an authority to allow passengers on the flight. Eight passengers were taken on board this flight including four children, but none was issued with a visitor pass or manifested in the company system as passengers, because the airport procedure did not require a visitor pass for passengers and the company did not require the manifest for a non-revenue flight. Therefore, the passengers were travelling on a test flight with almost no record kept on ground. Firstly, the passengers are not allowed to be taken onboard such flights. Further to the dismay, no record of the passengers was available at the airport. The certificate of indemnity form for the passengers was destroyed for this flight too after landing.

The company initiated an investigation of the events, because it believed that the events might have implications leading to damage the company brand, and it might also be a breach of the company code of business integrity. However, the company was not aware of the non-compliance of the aviation safety regulations till the event was reported by media. The investigation looked at the test flight procedures of the company and found that only flight crew and aircraft engineers are required to participate on a test flight according to the procedure. The procedure further mentioned that passengers cannot be carried onboard a test flight. Additionally, the company SOP documents clearly define a test flight and its requirements. According to the document, a test flight is any flight that requires a pilot to examine any aspect of performance of an aircraft or of any of its systems or components in order to assess their serviceability or to assist in the diagnosis of any defects, which may be known to exist. Test flights are required to be carried out to assist engineering department in aircraft defect diagnosis following a major component change or after rectification or adjustment of a flight control, engine or avionics system or component of an aircraft. This implies that there was a breach of company SOP also occurred in this case. As the occurrence of the event was not formally reported on time, it delayed the commencement of the investigation. Consequently, it delayed interviewing the employees involved in the event. This had negatively impacted on identifying any human factor related safety issue that might have influenced the event. Safety event reporting is a requirement of the company and safety reports must be submitted as soon as possible, not only for occurrences, but also for near misses and hazards. Favourably, the company also had several confidential reporting options available to every employee. Finally, the investigation had found that the company procedure manual contained adequate technical details and instructions for pilots about documentations and processes. Additionally, amplified procedures for identification of a test flight, associated requirements and restrictions were also available in the manual.

4 Discussion

During the pre-flight planning stages, the PF had several opportunities, responsibilities and legal requirements to fully understand the airworthiness of an aircraft before signing acceptance of the aircraft for the carriage of passengers. Various sections of the aviation regulations prohibit the carriage of passengers on certain flights that include a test flight (Federal Register of Legislation, 2022). According to the regulations, pilot in command of an aircraft that carries a passenger must not engage in practice of emergency procedures in the aircraft or testing an aircraft or its components, power-plant, or aircraft equipment. Similarly, the company operations manual also prohibits the carriage of passenger during a test flight. Onboard a test flight, only relevant flight crew and engineers (if required) to participate in the test shall be carried according to the manual.

Based on the analysis of information obtained and reviewed during the investigation, there was an insufficient evidence to establish whether any human factor contributed to the PF failing to capture the notated flight test limitation being imposed on a test flight. On both flights, no passenger manifest was prepared, because the company had no requirement to do so for a non-revenue flight. However, not having a passenger manifest did result in it being unclear who were onboard the flights. Similarly, the PF believed that he had the authority to permit passengers on non-revenue flights, but the company instruction manual stated otherwise, this study has noted. The PF also disposed of the

certificate of indemnity form of the passengers after the flight, because he could see no reason to keep them. However, the investigation noticed that there was no clear documented process in the company on how these documents were to be managed after a flight.

On a positive note, the company employees interviewed as a part of the investigation confirmed that they felt there was a good safety reporting culture in the company. However, this occurrence was not reported. Likewise, the company did embark on a deliberate and systematic campaign in the past to promote all types of reporting and hazard identification, thereby reinsuring employees that they would be fully supported with any reporting by the company. Hence, if established processes and due diligence were taken by the pilots during review of associated paperwork and signing acceptance of the aircraft for flights, this occurrence would not have happened.

5 Findings and root cause analysis

Operations manual and SOP of the company contained adequate technical details on the processes and use of relevant forms as well as they amplified these procedures for an effective identification of a test flight and its associated requirements and restrictions. Nevertheless, the PF failed to determine the appropriate procedure prior to signing acceptance of the aircraft and authorising flight with passengers, because he did not refer to the required documentation prior to the flight. This suggests that both pilots performed a suboptimal preparation for both the flights. This resulted in not picking up any abnormalities with the planned flights that could have prevented the flights from proceeding. Similarly, the aircraft engineer could have prevented the second flight from taking place, if he had taken immediate action and reported the first flight occurrence before going for the second flight. Likewise, the company did not have any documented procedure in place for a manifest to be completed and retained at the point of departure. Also, there was no established documented procedure at the company for the management and retention of the certificate of indemnity forms. Likewise, there was no clear definition of a non-revenue flight at the company. So, it was possible for a pilot to get confused and consider a test flight as a non-revenue flight as well. Equally, the occurrence was not promptly reported into the safety management system of the company by the relevant employees. This raises questions about safety reporting culture of the company. It is a mandatory requirement to report safety occurrences and Australian reporting practice is consistent with ICAO requirements for the mandatory reporting of the occurrences (CASA, 2020). According to Australian Transport Safety Bureau (2021), reportable matter is an occurrence that has not had a serious outcome and does not require an immediate reporting, but transport safety was affected or could have been affected. Therefore, a responsible person who has knowledge of a routine reportable matter must report it within 72 hours with a written report to a nominated official, the Bureau has noted. Probable root cause of this noncompliance of “carriage of passengers on a prohibited flight” regulations is that the PF commenced flight without reviewing all required documents necessary to ensure that the aircraft were safe and legally compliant for the intended flights in all respects, because he was under the belief that he had the authority to approve carriage of passengers on a non-revenue flight. The confusion occurred, because he considered the test flight, same as a non-revenue flight.

Additionally, an aviation-system failure was also noticed during the analysis. The airport did not issue any visitor pass to the passengers, because the aircraft operating company informed the airport that they are passengers. According to the airport procedures, a passenger does not require the pass, because he or she is manifested by the aircraft operating company into its system. However, the company did not manifest the passengers, because the company procedure does not require it for a non-revenue flight. The pilot considered the flights as non-revenue flights, so the passengers were not recorded anywhere except in the air traffic control (ATC) voice recording system. According to air traffic procedures, relevant ATC records total number of occupants on board a flight. This includes passengers and crew, but ATCs do not record passengers and crew separately, nor do they record any identity details of the occupants. Consequently, there were no records of passengers kept on ground. This is a system weakness that could cause serious issues in case of an aircraft accident, because it would be difficult to identify passengers in that case. Likewise, a noncompliance may result in a loss associated with high cost and risk to life and property (Udoh, 2020).

6 Lesson learnt and limitations of this study

Continuous promotion and reassurance to all staff from management of the company is necessary on the importance and requirements of submitting a safety report immediately, even if they were not directly evolved in an occurrence or potential occurrence. Confusion of difference between a non-revenue flight and a test flight needs to be clarified, because a test flight is also a non-revenue flight from a finance point of view. Similarly, a clear company procedure about passenger manifest and related documentation is required. So, that the system failures can be mitigated.

Since this paper is based on a real case that happened in Australia in the past and the investigation report was not put in the public domain, certain information remains classified to protect identification of the company and people involved in the incident. For example, references of the company SOPs and operations manuals could not be provided in this paper. However, no assumptions are made in this study. The factual information is presented in this paper without any alteration.

7 Conclusions

Aviation industry has a significant contribution in economic development of a nation. GA is a junior partner of this multidimensional industry, and it primarily serves regional communities of a country. Therefore, it operates small aircraft, such as low-capacity airplanes and helicopters on non-scheduled flights. Due to safety sensitive activities, the aviation industry is considered as one of the highly regulated businesses. Though the aviation regulatory standards and practices for aircraft airworthiness and flight operations are developed internationally, they are implemented by respective NAAs within their jurisdictions. Therefore, implementation and compliance of the regulations are crucial for safe outcomes of aviation activities, because commercial pressure can be challenging, sometimes. At times, understanding and interpreting the complex aviation regulatory framework also presents challenges to aviation personnel, especially technical workers, such as pilots and aircraft engineers.

This paper has examined non-compliance of aviation regulations and SOPs that occurred at a GA company in regional Australia. The typical flights were operated by test pilots and aircraft engineers to carry out test flights required after performing major maintenance tasks on the aircraft. This study has found that a major non-compliance happened related to “carriage of passengers on prohibited flights” regulations, because passengers were carried onboard a test flight. According to the regulations, test flights are abnormal flights. Therefore, carrying passengers on such flights is prohibited. Pilot in command of the flights authorised the carriage of passengers on the flights confusing the test flights with a non-revenue flight. The company SOP was very clear on this matter and there was no ambiguity in the procedure was noticed. Furthermore, the company policy and procedure about a test flight were consistent with the Australian civil aviation regulations, this paper has noted. Therefore, this non-compliance would not have occurred, if the pilots had referred the company procedure carefully before commencing the flight.

The paper could not establish any obvious human factor error as such in this incident. An aviation-system failure however was identified by this research. It was related to passenger manifestation and documents preservation thereof. Neither the airport or the company had a fool-proof or seamless passenger recording system. Therefore, no identity record of the passengers of the flights was documented in that case. Such flaw in the system may cause serious issues in identifying passengers, if a fatal accident happens, the study concludes. Similarly, the company did not have a strong safety reporting culture. This is demonstrated by non-reporting of this occurrence.

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Note

- 1 An AOC is the permission document granted by a NAA to a company to allow it to operate aircraft for commercial purposes.